
Question to EURCAW-Pigs: Provision of hiding opportunities

21 October 2024

Question

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EURCAW-Pigs received the following questions from a veterinary specialist in one of the Member States:

1. *Council Directive 2008/120/EC demands escape and hide opportunities for weaners and rearing pigs (Chapter II D. Weaners and rearing pigs) and to minimise aggression in groups of sows and gilts (Chapter II B. Sows and gilts). "Do you have other information on a European country which included this part in their national law?"*
2. *"What should hide opportunities look like? E.g. in case of walls, what minimal length would you recommend and how many hiding opportunities are needed/recommended for what amount of animals? "*

Several EURCAW-Pigs experts contributed to the response below. The EURCAW-Pigs secretariat did the final editing, and may be contacted for queries: info.pigs@eurcaw.eu.

Answer

In short, the answers are:

1. Based on a survey (by E-mail) EURCAW-Pigs receive the information that in some Member States (MS) the need for the provision of escape and hiding opportunities has been addressed in the national law according to the current EU legislation (2008/120/EC). However, based on the answers received from MS, details on the technical implementation of this requirement with regards to the features of an escape area or hiding opportunity as well as the number of hiding opportunities/animals are not included in national legislations of EU member states.
2. According to the literature, barriers behind which weaners can hide may reduce aggression after mixing. Studies indicate that it is not necessary for a pig to hide completely (i.e., with its full body). Boxes in which they can hide only their heads may also reduce aggression, especially in pens with limited space or flight distance.
The use of pens that allow for greater distances between pigs may reduce aggression levels after mixing in both weaners and fattening pigs. Additionally, the provision of extra space via an elevated platform (two-level pens) may reduce aggression, as this provides an additional escape area.
Although specific dimensions of barriers are mentioned in the literature, it is not possible to derive concrete recommendations as they vary greatly.

For sows, the use of a mixing pen that provides sufficient space after weaning and before insemination or at first grouping after insemination has been shown to reduce aggression. Information from the literature suggests an area of 4-6m² per sow.

With regard to the number of escape opportunities and the corresponding number of animals, no information exist on this requirement to our knowledge

Background

Survey

According to European Union (EU) Council Directive 2008/120/EC laying down minimum standards for the protection of pigs, measures should be taken to minimise aggression in groups of sows and gilts (Chapter II B). Also, weaners and rearing pigs should be provided with adequate opportunities to escape and hide from other pigs when unfamiliar pigs are mixed together (Chapter II D). However, little is known on how this might be implemented under national law. Thus, in July 2024, EURCAW-Pigs performed an email survey with twenty-two competent authorities from the different Member States asking for feedback on:

- whether escape and hide opportunities for pigs are addressed in the national legislation of their country, and
- whether they know of any (legal or practical) recommendation on how escape and hide opportunities technically may be implemented.

Nine Member States provided replies to the queries by end of August. From the answers, one country did not address this requirement in their national legislation, while in some countries the requirement (2008/120/EC) for escape and hiding opportunities for pigs has been transposed into the national legislation. Some Member States have included additional measures in their national legislation. As an example, the German regulation on animal welfare and husbandry (*Tierschutz-Nutztierhaltungsverordnung*, "TierSchNutzTV") sets specific requirements for the welfare of sows. According to TierSchNutzTV (2001, version dated January 29, 2021), starting in 2029, each sow must be provided with at least 5m² of unrestricted floor space during the period from weaning until insemination. Of this space, at least 1.3m² per sow must be designated as a lying area, while the remaining area is to be used as an activity area.

Literature review

Aggressive behaviours in pigs can occur during mixing or regrouping or during competition over limited resources such as feed (Hoorweg et al., 2017). In the following, we will focus on the aggressive behaviour which mainly occurs during mixing and regrouping (Schubbert et al., 2020; EFSA 2022; Kongsted & Patt 2023).

In commercial pig farming, pigs are often mixed at various stages of the production cycle as part of management practices. Typically, in growing pigs mixing occurs after weaning and at the start of the finishing period to ensure an even number of pigs in the pen according to their weight and the pen size (Spooler et al., 2000).

Sows will be mixed after weaning and in early pregnancy either with familiar or unfamiliar sows (Merchant-Ford 2009). Mixing of unfamiliar pigs disrupts the social structure of a given group which can provoke intense aggression and fights aimed at establishing or re-establishing a social relationship (Meese and Ewbank, 1973). The levels of aggression may be influenced by the space

allowance, group size, management practices and design of the pen (Verdon et al., 2015, Edwards, et al., 1993).

During fights, dominant pigs may threaten, push, head knock, chase and force subordinate pigs to leave and avoid certain areas (McGlone et al., 1985, Turner et al., 2006). If escape opportunities are available, subordinate pigs may show normal signs of submission such as fleeing away during aggression (Waran and Broom 1993). Additionally, subordinate pigs may also disappear into the group to avoid confrontation as group size increases (Spoolder et al., 2009). Aggressive encounters can negatively affect the wellbeing of pigs by causing fear, injuries, stress and reduced weight (Spoolder et al., 2000). Furthermore, in sows, aggression during mixing has been associated with lower conception rate on some farms (Pedersen et al., 2007).

Therefore, to allow pigs to avoid or escape from aggression, appropriate escape or hiding opportunities should be provided. According to the literature, the following measures have been shown to provide escape and hiding opportunities for pigs: 1) space per pig (flight distance), 2) pen size/ shape, and 3) the presence of barriers or partitions in the pen.

Escape and hiding opportunities for weaners

Insufficient space at mixing can compromise pigs' ability to avoid or escape from aggression. In piglets, the provision of additional space through elevated platforms (two-level pens) has been reported to improve the welfare of weaned pigs by decreasing aggression and social stress. Furthermore, the second level in the pen can be beneficial for pigs, as it creates separate areas for activity and for retreating from other pen mates (Laves et al., 2021; Kauselmann et al., 2023)

Another factor that can influence aggression levels during mixing is the shape of the pen. Weigand et al. (1994) tested the effect of pen shape (rectangular, triangular, square, and circular) on the behavior of pigs, providing each piglet with either 0.396 or 0.356 m² of space. The findings showed that post-mixing aggression during the first week was higher in circular pens than in square pens, with intermediate aggression levels in the other shapes. This effect was attributed to the presence of corners, where pigs could hide their heads to avoid confrontation. Therefore, the absence of corners in circular pens led to higher aggression levels, while square pens, with four corners, had the lowest aggression. This was followed by triangular pens with three corners and rectangular pens with two usable corners due to the position of the feeder.

In a second experiment, Weigand et al. (1994) studied the behavior of pigs in the circular pen fitted with two 0.5 m walls extending inward from the perimeter, at opposite ends of the same diameter, against the square pen from the first experiment. No difference was found in the levels of aggression between the square pen and the altered circular pen, due to the addition of pen corners created by the barriers in the altered circular pen.

Furthermore, the frequency of aggressive interactions that occurred during the weaning period did not differ between either a conventional flat-deck pen (area of 2.4 m²/10pigs, **Fig. 1**) or a straw pen (area 4.08m²/10pigs, **Fig. 2**) in a study by Waran and Broom (1993). However, when barriers were included in the pens (0.61m in the conventional flat deck; 0.64m in the straw pen) the frequency of aggressive interactions was 40% lower during the first week after weaning and

growth rate was proportionately greater by 15% in both types of pens. Additionally, lower ranking pigs were found to use the barriers more frequently and gained the most weight during the early weaning period.

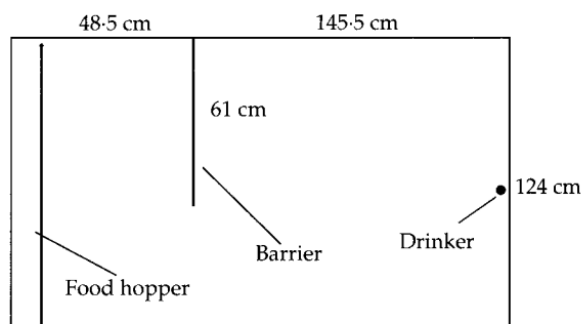


Figure 1 A plan of the flat-deck cage showing the position of the barrier.

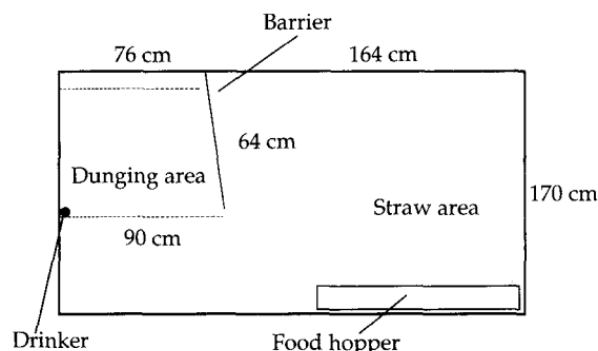


Figure 2 A plan of the straw pen showing the position of the barrier.

from: Waran & Broom 1993

Similarly, McGlone and Curtis (1985) observed a reduction in levels of aggressive activity during the first seven days after weaning when hide areas, consisting of a "20 x 23 x 25 cm box" where pigs could hide their heads and necks, were provided in the pens (1.2 x 1.2 m per five pigs).

On the other hand, results from other studies indicated a contradictory effect of hide areas and partitions on levels of aggression. In one study, when half of the 1.2 x 1.8 m pens housing 7 to 10 pigs were equipped with head hides for the first five days after weaning and regrouping, Francis et al. (1996) found no effect of head hide areas on the aggressive behaviour of weaned piglets. According to Francis et al. (1996), the use of larger group sizes and larger pens, which provided a greater escape distance, may have contributed to the limited use of hiding areas. In addition, the presence of partitions (20 x 30 cm ports placed diagonally across alternate pens within the same room) and corners did not reduce levels of aggression in newly weaned pigs (Olesen et al., 1996).

Escape and hiding opportunities for fattening pigs

For fattening pigs, providing extra space by constructing a second level (elevated platforms) in an existing pen has been reported to improve welfare by decreasing the incidence of aggressive encounters, such as pen mate manipulations and head knocks (Bulens et al., 2017a).

The pen shape and size may offer pigs opportunities to escape from aggressive pen mates when mixing unfamiliar pigs. Seventy finishing pigs were mixed in two rectangular pens, each providing an equal space allowance of 1.1 m²/pig, with 35 pigs per pen (total area of 38.5 m²). The perimeter-to-area ratio (P:A ratio), length-to-width ratio (L:W ratio), D_{max} (maximum distance between two individuals) and DC (distance to the nearest corner) was lower in Pen A compared to pen B while DW (distance to the nearest wall) was higher, see **Figure 3**. Additionally, the percentage of pigs with visible fighting marks was lower in Pen A than in Pen B, despite the similar space allowance per pig.

These results were attributed to Pen A's more square-like shape compared to Pen B that led to a decrease in aggression between pigs (Ladosi et al., 2024). Also, a lower DC will give the pigs a closer place to hide from potential aggression.

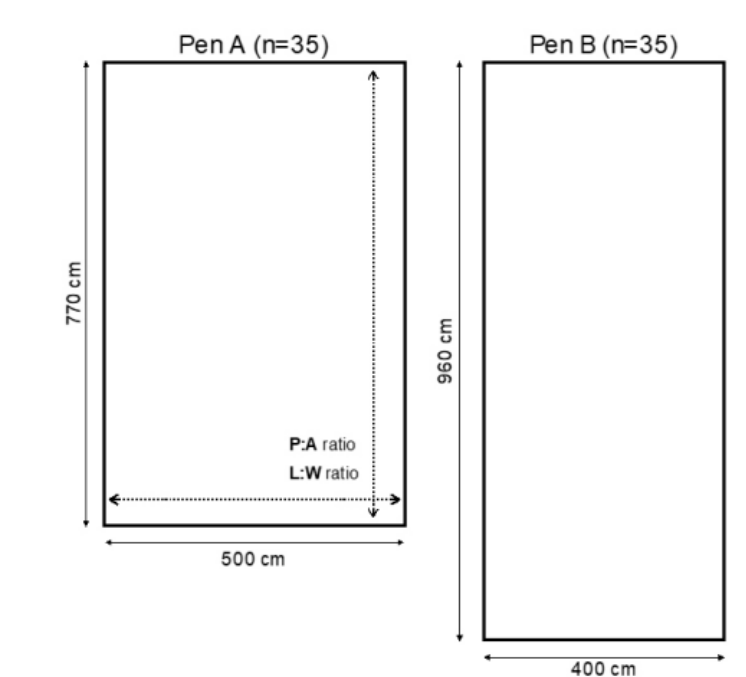


Figure 3 from Ladosi et al., 2024

The effect of partitions on escape attempts has been inconsistent across studies. For fattening pigs, Spooler et al. (2000) studied the effect of pens with or without kennel walls (2.6 x 1.2m) on the incidence of aggression and duration of fights when fattening pigs were mixed at 55kg and 75kg bodyweight. The presence of a kennel appeared to reduce the average duration of fights, but the effect on the proportion of fights involving location changes (from lying to dunging area or vice versa) was not significant. Additionally, the incidence of aggression and duration of fights were lower in the kennelled pens when pigs were first mixed at 55kg. However, when pigs were mixed again at 75kg the frequency of aggression was greater in the kennelled pens although the average duration of fights was significantly shorter. The results of this study failed to provide conclusive report on the effect of barriers on aggression in fattening pigs.

Similarly, Van der Peet-Schwering et al., 2013 observed no effect of a barrier (1-meter-long and 40% of the pen width) on the behaviour of entire male finishing pigs kept in pens (12 or 24 pigs per pen; 1 m² per pig) with or without hiding halls.

In a more recent study, the effect of a hiding wall on the behavior of fattening pigs was tested by comparing pigs in standard pens with those in pens equipped with a hiding wall. The hiding wall consisted of two solid panels constructed in a 'T' shaped against the side or back wall of the pen (**Fig 4**). The longest panel (L-1.25 m; H-1.10 m) was placed perpendicular to the wall of the pen while the shortest panel (L-1 m; H-1.10 m) was placed perpendicular to the longest panel. The

results showed that the presence of a hiding wall in pens did not reduce the frequency of aggressive behavior, such as fighting and head knocking, and the frequency of mounting was also not affected (Bulens et al., 2017b).

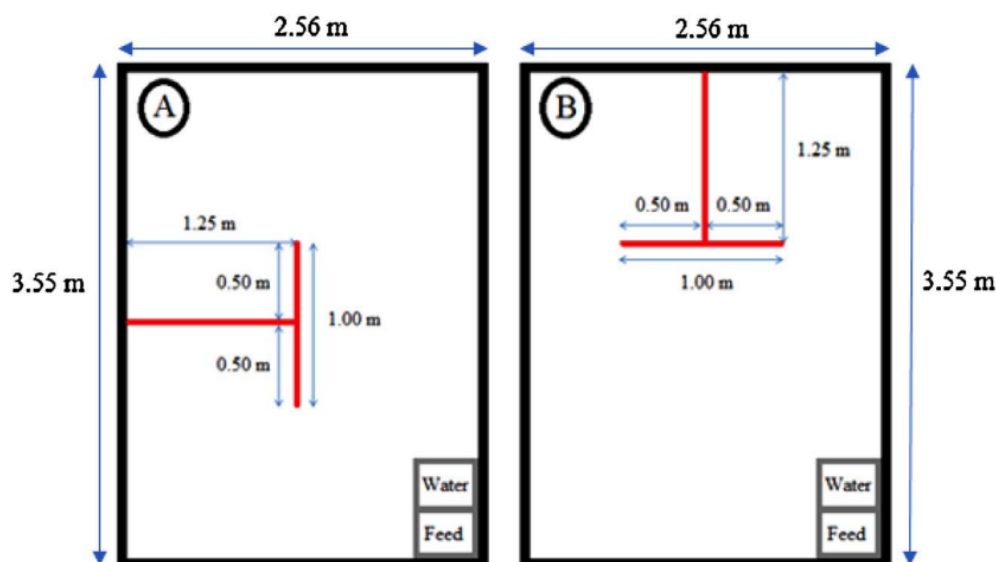


Figure 4, from: Bulens et al., 2017b

Escape and hiding opportunities for group-housed sows

The amount of *space at mixing* may influence the levels of aggression between sows. In a study on the impact of space allowance (2.0, 2.4, 3.6, or 4.8 m²/sow) on sow behaviour, Weng et al. (1998) observed an increase in the total frequency of social interactions and aggressive behaviour as space allowance decreased. Additionally, the attack/retreat ratio was significantly higher in the smallest pen. Therefore, sows with insufficient space seem to be unable to exhibit submissive behaviours such as fleeing from an aggressor.

When groups of six sows were mixed in pens with large (6.13 m²) and small (3.72 m²) space allowances, Edwards et al. (1993) observed that, although aggression was higher in larger pens during the initial 12 hours after mixing, lesion scores indicated that the aggression was actually more severe in smaller pens. Similarly, the area per sow (3.0 and 6.5 m²) did not appear to play a large role in the occurrence of aggression after grouping. However, it was observed that the availability of a place to hide in a small pen could benefit weaker sows (Olsson and Samuelsson 1993).

Furthermore, when unfamiliar sows were mixed at weaning in a large (18 x 10.5m) pen, where flight and chase distance were unlikely to be limited, Kay et al. (1999) observed that the majority of aggressive interactions occurred during the first few hours after mixing, and for 95% of all interactions, the flight distance was < 13.6m while the chase distance was < 6.8m. Additionally, 50% of flight distances were < 4.7m and there was no chase in 63% of cases for all interactions.

Hence, sows should be kept in specialized mixing pen during the first 2-3 days after weaning (reviewed by Verdon et al., 2015). The pen should offer sufficient space (open areas of at least 4-6 m² per sow) to allow fighting while enabling sows maintain a flight distance of 10-12 meters (Spoolder et al., 2009). Baxter (1985) calculated the space for two sows engaged in a two-sided fight to be $0.11 * W^{0.667}$, where W represents the sow's body weight. For two average sized pregnant sows with a bodyweight of 240 kg the formula would result in a space required for agonistic interactions of 4.2 m² (see review by EURCAW-pigs Schubbert et al., 2020). This suggests that additional space is necessary.

However, the layout of the pen (pen shape/size) can allow subordinate pigs to hide during aggressive encounters. Barnett et al., (1993) studied the effect of pen size/shape on aggression when unfamiliar gilts were grouped together. The findings showed that, lower levels of aggression were observed in rectangular pens with a space allowance of 1.4m², compared to similar-sized square pens or larger pens with a space of 3.4m² per pig.

Similarly, Docking et al., (2000) investigated how pen shape (E: elongated rectangular, R: rectangular, S: square, and C: circular) and stocking density (H: 4.1 m² and L: 9.3 m² per sow) affected aggression levels during mixing. The study revealed that aggression was lower at reduced stocking densities in elongated rectangular and circular pens, suggesting that these shapes, when paired with greater space allowances, are most effective in reducing aggression. However, to minimize costs, rectangular pens with low stocking densities were recommended in this study.

Also, the modification of the pen by the installation of barriers as partitions or hiding walls can facilitate escape and retreat during aggression (Spoolder et al., 2009; Verdon et al., 2015). Edwards et al. (1993) reported a 30% decrease in the total aggression within 12 hours after mixing when barriers (1m high metal frames covered by sacking and suspended from the ceiling) were fitted in the pen. However, other studies found no effect of partitions on the incidence of aggression 70 min after mixing in sows (Clarke et al., 2016) and on fighting activity over a 3-day post-grouping period in gilts (Luescher et al., 1990). Nevertheless, partitions were reported to have a positive effect on the activity patterns of sows, as sows with partitions were calmer, more relaxed (Clarke et al., 2016)

In Conclusion:

For weaners and fattening pigs:

Studies on weaners indicate that hiding opportunities such as by barriers may reduce aggression. Based on the findings, it does not seem necessary for a pig to hide completely (i.e. with its full body). Boxes in which they can hide with only their heads may also reduce aggression, especially in pens with limited space or flight distance. Additionally, the use of pens allowing for greater distances between pigs may reduce the levels of aggression in the pen after mixing in both weaners and fattening pigs. Elevated platforms have also been shown to reduce aggression after mixing. These structures offer additional space, and allow for greater distances between different floor levels. However, there is still a lack of studies on this issue, and more research is needed to derive specific recommendations on hide opportunities.

For sows:

A specialized mixing pen with sufficient space had been recommended to be used in the period immediately following mixing after weaning. The pen should offer sufficient space (open areas of at least 4-6 m² per sow) to allow fighting while enabling sows maintain a flight distance of 10-12 meters. The shape of the mixing pen may help minimize levels of aggression during mixing, the use of rectangular pens with larger space allowance (and flight distance) is recommended during mixing in sows.

References:

Barnett, J. L., Cronin, G. M., McCallum, T. H., Newman, E. A. (1993). Effects of pen size/shape and design on aggression when grouping unfamiliar adult pigs. *Applied Animal Behaviour Science*, 36(2-3), 111-122.

Baxter, M. (1985). *Social space requirements of pigs*. In *Social Space for Domestic Animals* (pp. 116-127). Dordrecht: Martinus Nijhoff Publishers.

Bulens, A., Van Beirendonck, S., Van Thielen, J., Buys, N., Driessen, B., (2017b). Hiding walls for fattening pigs: Do they affect behavior and performance? *Applied Animal Behaviour Science*, 195, 32-37.

Bulens, A., Van Beirendonck, S., Van Thielen, J., Buys, N., Driessen, B., (2017a). A two-level pen for fattening pigs: Effects on behavior, performance, and postslaughter measurements. *Journal of Animal Science*, 95(2), 616-625.

Clarke, T., Pluske, J. R., Collins, T., Miller, D. W., & Fleming, P. A., (2016). A quantitative and qualitative approach to the assessment of behaviour of sows upon mixing into group pens with or without a partition. *Animl Prod Sci*, 57(9), 1916-1923.

Docking, C. M., Kay, R. M., Whittaker, X., Burfoot, A., & Day, J. E. L., (2000). The effects of stocking density and pen shape on the behaviour, incidence of aggression and subsequent skin damage of sows mixed in a specialised mixing pen. In *Proceedings of the British Society of Animal Science* (Vol. 2000, pp. 32-32). Cambridge University Press.

EC (2008). Council Directive 2008/120/EC of 18 December 2008 laying down minimum standards for the protection of pigs. <https://edepot.wur.nl/146801>

Edwards, S. A., Mauchline, S., & Stewart, A. H., (1993). Designing pens to minimise aggression when sows are mixed. 20-23

EFSA Panel on Animal Health and Welfare (AHAW), Nielsen, S.S., Alvarez, J., Bicout, D. J., Calistri, P., Canali, E., Drewe J. A., Garin-Bastuji, B., Gonzales Rojas, J. L., Schmidt, G, Herskin, M., Michel, V., Miranda Chueca, M. Á., Mosbach-Schulz, O, Padalino, B., Clare Roberts, H., Stahl, K., Velarde, A., Viltrop, A., Winckler, C., Edwards, S., Ivanova, S., Leeb, C., Wechsler, B., Fabris, F., Lima, E., Mosbach-Schulz, O., Van der Stede, Y., Vitali, M., & Spoolder, H., (2022) Welfare of pigs on farm. *EFSA Journal*, 20(8), e07421.

Francis, D. A., Christison, G. I., & Cymbaluk, N. F. (1996). Uniform or heterogeneous weight groups as factors in mixing weanling pigs. *Canadian Journal of Animal Science*, 76(2), 171-176.

Hoorweg, F. A., Vermeer, H. M., Pedersen, L. J., & Spoolder, H. A. (2017). Review on hunger induced behaviours: aggression and stereotypies. *Regulation (EU)*, 625.

Kauselmann, K., Schrader, L., & Krause, E. T. (2023). Elevated platforms for pigs—a review. *Livestock Science*, 105362.

Kay, R. M., Burfoot, A., Spoolder, H. A. M., & Docking, C. M. (1999). The effect of flight distance on aggression and skin damage of newly weaned sows at mixing. In *Proceedings of the British Society of Animal Science* (Vol. 1999, pp. 14-14). Cambridge University Press.

Kongsted, H., & Patt, A., (2023). *Review on keeping entire male pigs*. EURCAW-Pigs.

Ladosi, I., Deac, A., S, R., Ladosi, D., & Zahan, M. (2024). Effects of nursery and finishing pen shape on pig performance and welfare. *Journal of Central European Agriculture*, 25(1), 35-46.

Laves, J., Herbrandt, S., Van Meegen, C., Kemper, N., & Fels, M., (2021). Effect of pens with an elevated platform on space utilization, skin lesions and growth performance in nursery pigs. *Animal*, 15(1), 100002.

Luescher, U. A., Friendship, R. M., & McKeown, D. B. (1990). Evaluation of methods to reduce fighting among regrouped gilts. *Canadian Journal of Animal Science*, 70(2), 363-370.

Marchant-Forde, J. N. (2009). *Welfare of dry sows*. In J. N. Marchant-Forde (Ed.), *The welfare of pigs* (pp. 95-140). West Lafayette: Springer Science and Business Media B.V.

McGlone, J. J. (1985). A quantitative ethogram of aggressive and submissive behaviors in recently regrouped pigs. *Journal of Animal Science*, 61(3), 556-566.

McGlone, J. J., & Curtis, S. E., (1985). Behavior and performance of weanling pigs in pens equipped with hide areas. *Journal of Animal Science*, 60(1), 20-24.

Meese, G. B., & Ewbank, R. (1973). The establishment and nature of the dominance hierarchy in the domesticated pig. *Animal behaviour*, 21(2), 326-334.

Olesen, L. S., Nygaard, C. M., Friend, T. H., Bushong, D., Knabe, D. A., Vestergaard, K. S., & Vaughan, R. K. (1996). Effect of partitioning pens on aggressive behavior of pigs regrouped at weaning. *Applied Animal Behaviour Science*, 46(3-4), 167-174.

Olsson, A. C., & Samuelsson, O. V. (1993). *Grouping studies of lactating and newly weaned sows*. In: Collins, E., Boon, C. (eds), *Livestock Environment IV* ...109 pages.

Pedersen, L. J. (2007). Sexual behaviour in female pigs. *Hormones and behavior*, 52(1), 64-69.

Schubbert, A., Spoolder, H. A., & Pedersen, L. J., (2020). *Review on group housing and mixing of sows*. EURCAW-Pigs.

Spoolder, H. A. M., Edwards, S. A., & Corning, S. (2000). Aggression among finishing pigs following mixing in kennelled and unkennelled accommodation. *Livestock Production Science*, 63(2), 121-129.

Spoolder, H. A. M., Geudeke, M. J., Van der Peet-Schwering, C. M. C., & Soede, N. M., (2009). Group housing of sows in early pregnancy: A review of success and risk factors. *Livestock Science*, 125(1), 1-14.

Turner, S. P., Farnworth, M. J., White, I. M., Brotherstone, S., Mendl, M., Knap, P., Penny, P., & Lawrence, A. B., (2006). The accumulation of skin lesions and their use as a predictor of individual aggressiveness in pigs. *Applied Animal Behaviour Science*, 96(3-4), 245-259.

Van der Peet-Schwering, C. M., Troquet, L. M. P., Vermeer, H. M., & Binnendijk, G. P. (2013). *Effect of light, group size and hiding walls on behaviour of boars*. Wageningen Livestock Research.

Verdon, M., Hansen, C. F., Rault, J. L., Jongman, E., Hansen, L. U., Plush, K., & Hemsworth, P. H. (2015). Effects of group housing on sow welfare: A review. *Journal of animal science*, 93(5), 1999-2017

Waran, N. K., & Broom, D. M. (1993). The influence of a barrier on the behaviour and growth of early-weaned piglets. *Animal science*, 56(1), 115-119.

Weng, R. C., Edwards, S. A., & English, P. R. (1998). Behaviour, social interactions and lesion scores of group-housed sows in relation to floor space allowance. *Applied Animal Behaviour Science*, 59(4), 307-316.

Wiegand, R. M., Gonyou, H. W., & Curtis, S. E. (1994). Pen shape and size: effects on pig behavior and performance. *Applied Animal Behaviour Science*, 39(1), 49-61.